## AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A motion compensation method comprising:

interpolating sub-pixels in a reference picture; and

performing motion compensation based on the interpolated reference picture,

wherein said interpolating includes:

a first calculation step of calculating intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a first rounding step of deriving the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated in said first calculation step instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said performing of motion compensation includes

a motion compensation step of performing motion compensation based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said first calculation step includes multiplying, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used in said first calculation step are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded in said first rounding step, and ~~none of the intermediate values calculated in said first calculation step exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

2. (Cancelled)

3. (Previously Presented) The motion compensation method according to Claim 1,

wherein said interpolation further includes:

a second calculation step of calculating, using the sub-pixel values of the sub-pixels derived in said first rounding step, intermediate values of the second sub-pixels; and

a second rounding step of deriving the sub-pixel values of the second sub-pixels by rounding the intermediate values calculated in said second calculation step.

4. (Previously Presented) The motion compensation method according to Claim 3,

wherein said first calculation step includes calculating three intermediate values of a-fourths sub-pixels that are arrayed in the second direction, and

wherein said second calculation step includes calculating three intermediate values of a-fourths sub-pixels that are arrayed in the second direction.

5. (Previously Presented) The motion compensation method according to Claim 4,

wherein said first calculation step includes calculating the intermediate values of three a-fourths sub-pixels using the following equations when eight pixel values of pixels arrayed in the first direction are represented as A, B, C, D, E, F, G and H respectively and the three a-fourths sub-pixel values are represented as $h_1$, $h_2$ and $h_3$ respectively:

$$h_1 = -1 \cdot A + 3 \cdot B - 10 \cdot C + 59 \cdot D + 18 \cdot E - 6 \cdot F + 1 \cdot G - 0 \cdot H;$$

$$h_2 = -1 \cdot A + 4 \cdot B - 10 \cdot C + 39 \cdot D + 39 \cdot E - 10 \cdot F + 4 \cdot G - 1 \cdot H; \text{ and}$$

$$h_3 = -0 \cdot A + 1 \cdot B - 6 \cdot C + 18 \cdot D + 59 \cdot E - 10 \cdot F + 3 \cdot G - 1 \cdot H.$$

6. (Currently Amended) The motion compensation method according to Claim 5,

wherein said second calculation step includes calculating the intermediate values of three a-fourths sub-pixels using the following equations when eight pixel values of pixels arrayed in the second direction are represented as $D_1$, $D_2$, $D_3$, $D_4$, $D_5$, $D_6$, $D_7$ and $D_8$ respectively and the three a-fourths sub-pixel values are represented as $v_1$, $v_2$ and $v_3$ respectively:

$$v_1 = -1 \cdot D_1 + 3 \cdot D_2 - 10 \cdot D_3 + 59 \cdot D_4 + 18 \cdot D_5 - 6 \cdot D_6 + 1 \cdot D_7 - 0 \cdot D_8;$$

$$v_2 = -1 \cdot D_1 + 4 \cdot D_2 - 10 \cdot D_3 + 39 \cdot D_4 + 39 \cdot D_5 - 10 \cdot D_6 + 4 \cdot D_7 - 1 \cdot D_8; \text{ and}$$

$$v_3 = -0 \cdot D_1 + 1 \cdot D_2 - 6 \cdot D_3 + 18 \cdot D_4 + 59 \cdot D_5 - 10 \cdot D_6 + 3 \cdot D_7 - 1 \cdot D_8.$$

~~$v_1 = -3 \cdot D_1 + 12 \cdot D_2 - 37 \cdot D_3 + 229 \cdot D_4 + 71 \cdot D_5 - 21 \cdot D_6 + 6 \cdot D_7 - 1 \cdot D_8;$~~

~~$v_2 = -3 \cdot D_1 + 12 \cdot D_2 - 39 \cdot D_3 + 158 \cdot D_4 + 158 \cdot D_5 - 39 \cdot D_6 + 12 \cdot D_7 - 3 \cdot D_8;$ and~~

~~$v_3 = -1 \cdot D_1 + 6 \cdot D_2 - 21 \cdot D_3 + 71 \cdot D_4 + 229 \cdot D_5 - 37 \cdot D_6 + 12 \cdot D_7 - 3 \cdot D_8$;~~

7. (Previously Presented) The motion compensation method according to Claim 6,

wherein said first calculation step includes calculating the intermediate values of the sub-pixels to be interpolated in a horizontal direction, the horizontal direction being determined as the first direction, and

wherein said second calculation step includes calculating the intermediate values of the sub-pixels to be interpolated in a vertical direction, the vertical direction being determined as the second direction.

8. (Previously Presented) The motion compensation method according to Claim 4, further comprising

a bilinear filtering of raising a sub-pixel accuracy by applying bilinear filtering to the reference picture having the interpolated first and second sub-pixels with the correspondingly derived sub-pixel values.

9. (Original) The motion compensation method according to Claim 8,

wherein said bilinear filtering includes raising the sub-pixel accuracy of the reference picture from a a-fourths sub-pixel accuracy to an a-eighths sub-pixel accuracy.

10. (Previously Presented) The motion compensation method according to Claim 1,

wherein said first rounding step includes rounding the intermediate values of the first sub-pixels by means of downshifting.

11. (Previously Presented) The motion compensation method according to Claim 1,

wherein said first calculation step includes calculating intermediate values of the first and second sub-pixels that should be arrayed in a horizontal direction and in a vertical direction by multiplying, with coefficients, pixel values of pixels included in the reference picture.

12. (Currently Amended) A motion estimation method comprising:

interpolating sub-pixels in a reference picture; and

performing motion estimation based on the interpolated reference picture,

wherein said interpolating includes:

a calculation step of calculating intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding step of deriving the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated in said calculation step instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said performing of motion estimation includes

a motion estimation step of performing motion estimation based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said calculation step includes multiplying, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used in said calculation step are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded in said rounding step, and ~~none of the intermediate values calculated in said calculation step exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

13. (Currently Amended) A moving picture coding method comprising:

obtaining a picture to be coded;

interpolating sub-pixels in a reference picture;

performing motion compensation based on the interpolated reference picture; and

coding a picture based on the reference picture,

wherein said interpolating includes:

a calculation step of calculating intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels

included in the reference picture; and

a rounding step of deriving the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated in said calculation step instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said performing of motion compensation includes

a motion compensation step of performing motion compensation of the picture based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said coding includes

a coding step of coding a differential between the picture to be coded that has been obtained in said picture obtaining and the reference picture of which motion compensation has been performed in said performing of motion compensation,

wherein said calculation step includes multiplying, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used in said calculation step are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded in said rounding step, and ~~none of the intermediate values calculated in said calculation step exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

14. (Currently Amended) A moving picture decoding method comprising:

obtaining a differential picture that is a resultant from coding the differential between a picture and another picture;

interpolating sub-pixels in a reference picture;

performing motion compensation based on the interpolated reference picture; and

decoding a coded picture based on a reference picture,

wherein said interpolating includes:

a calculation step of calculating intermediate values, which are bases of sub-pixel

values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding step of deriving the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated in said calculation step instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said performing of motion compensation includes

a motion compensation step of performing motion compensation of the picture based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said decoding includes

a decoding step of decoding the differential picture obtained in said differential picture obtaining and adding the decoded differential picture to the reference picture of which motion compensation has been performed in said performing of motion compensation,

wherein said calculation step includes multiplying, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used in said calculation step are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded in said rounding step, and~~none of the intermediate values calculated in said calculation step exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

15. (Currently Amended) A motion compensation apparatus comprising:

an interpolation unit operable to interpolate sub-pixels in a reference picture; and

a motion compensation unit operable to perform motion compensation based on the interpolated reference picture,

wherein said interpolation unit includes:

a calculation unit operable to calculate intermediate values, which are bases of

sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding unit operable to derive the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated by said calculation unit instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said motion compensation unit is further operable to perform motion compensation of the picture based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said calculation unit is further operable to multiply, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used by said calculation unit are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded by said rounding unit, and~~none of the intermediate values calculated by said calculation unit exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

16. (Currently Amended) A motion estimation apparatus comprising:

an interpolation unit operable to interpolate pixels in a reference picture; and

an motion estimation unit operable to perform motion compensation based on the interpolated reference picture,

wherein said interpolation unit includes:

a calculation unit operable to calculate intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding unit operable to derive the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated by said calculation unit instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said motion estimation unit is further operable to perform motion estimation

based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said calculation unit is further operable to multiply, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used by said calculation unit are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded by said rounding unit, and~~none of the intermediate values calculated by said calculation unit exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

17. (Currently Amended) A moving picture coding apparatus comprising:

a picture obtainment unit operable to obtain the picture to be coded;

an interpolation unit operable to interpolate sub-pixels in a reference picture;

a motion compensation unit operable to perform motion compensation based on the interpolated reference picture; and

a coding unit operable to code a picture based on a reference picture,

wherein said interpolation unit includes:

a calculation unit operable to calculate intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding unit operable to derive the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated by said calculation unit instead of directly using the intermediate values in calculating pixel values of second sub-pixels,

wherein said motion compensation unit is further operable to perform motion compensation of the picture based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said coding unit is further operable to code a differential between the picture to be coded that has been obtained by said picture obtainment unit and the reference picture of

which motion compensation has been performed by said motion compensation unit,

wherein said calculation unit is further operable to multiply, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used by said calculation unit are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded by said rounding unit, and ~~none of the intermediate values calculated by said calculation unit exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

18. (Currently Amended) A moving picture decoding apparatus comprising:

a differential picture obtainment unit operable to obtain a differential picture that is a resultant from coding the differential between a picture and another picture;

an interpolation unit operable to interpolate sub-pixels in a reference picture;

a motion compensation unit operable to perform motion compensation based on the interpolated reference picture; and

a decoding unit operable to decode a coded picture based on a reference picture,

wherein said interpolation unit includes:

a calculation unit operable to calculate intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding unit operable to derive the sub-pixel values of the first sub-pixels by rounding the intermediate values calculated by said calculation unit instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said motion compensation unit is further operable to perform motion compensation of the picture based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said decoding unit is further operable to (i) decode the differential picture obtained by said differential picture obtainment unit, and (ii) add the decoded differential picture

to the reference picture of which motion compensation has been performed by said motion compensation unit,

wherein said calculation unit is further operable to multiply, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used by said calculation unit are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded by said rounding unit, and~~none of the intermediate values calculated by said calculation unit exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.

19. (Currently Amended) A non-transitory computer readable recording medium having stored therein a motion compensation program, wherein, when executed, said motion compensation program causes a computer to perform a method comprising: interpolating sub-pixels in a reference picture; and performing motion compensation based on the interpolated reference picture,

wherein said interpolating includes:

a calculation step of calculating intermediate values, which are bases of sub-pixel values of first sub-pixels, by multiplying, with coefficients, pixel values of pixels included in the reference picture; and

a rounding step of rounding the intermediate values of the sub-pixel values of the first sub-pixels calculated in said calculation step instead of directly using the intermediate values in calculating sub-pixel values of second sub-pixels,

wherein said performing of motion compensation includes

a motion compensation step of performing motion compensation of the picture based on the reference picture having the interpolated first sub-pixels with the correspondingly derived sub-pixel values,

wherein said calculation step includes multiplying, with a corresponding coefficient, pixel values of six pixels included in the reference picture,

wherein the coefficients used in said calculation step are set so that no calculation using more than 16 bits is performed when calculating the intermediate values which are not yet rounded in said rounding step, and~~none of the intermediate values calculated in said calculation step exceed a 16-bit accuracy, and~~

wherein the first sub-pixels are sub-pixels that are interpolated in a first direction with respect to the reference picture, and the second sub-pixels are sub-pixels that are interpolated in a second direction with respect to the reference picture, the second direction being different from the first direction.